

**Claims**

1. Process for the treatment or pre-treatment of parts, profiles, strips, sheets and/or wires with metallic surfaces, in which at least 5% of these surfaces consist of aluminium and/or at least one aluminium alloy, and the other metallic surfaces can optionally consist predominantly of iron alloys, zinc and/or zinc alloys, with an acidic, aqueous solution containing fluoride, zinc and phosphate, characterised in that the dissolved contents in the phosphating solution are as follows:
- sodium: virtually none or in the concentration range of 0.04 to less than 2 g/l,
  - potassium: virtually none or in the concentration range of 0.025 to 2.5 g/l,
  - sodium and potassium together: in the concentration range of 0.025 to 2.5 g/l as sodium, the potassium content being converted to sodium on a molar basis,
  - zinc: in the concentration range of 0.2 to 4 g/l,
  - phosphate: in the concentration range of 4 to 65 g/l, calculated as  $\text{PO}_4$ ,
  - free fluoride: in the concentration range of 0.03 to 0.5 g/l,
  - total fluoride: in the concentration range of 0.1 to 5 g/l and
  - optionally nitrate: at least 0.2 g/l,
- wherein a zinc-containing phosphate film is deposited on the metallic surfaces with a coating weight in the range of 0.5 to 10 g/m<sup>2</sup>.
2. Process according to claim 1, characterised in that the contents of dissolved aluminium in the

phosphating solution are in the concentration range of 0.002 to 1 g/l.

3. Process according to claim 1 or 2, characterised in that the total content of silicon complex fluoride and boron complex fluoride together in the phosphating solution is 0.01 to 8 g/l - optionally converted on a molar basis as  $\text{SiF}_6$ , it being unnecessary for the two groups of fluoride complexes to occur at the same time.
4. Process according to one of the above claims, characterised in that the contents of complex bound fluoride in the phosphating solution are 0.01 to 8 g/l, calculated on a molar basis as  $\text{SiF}_6$ .
5. Process according to one of the above claims, characterised in that the contents dissolved in the phosphating solution are as follows:  
sodium: in the concentration range of 0.050 to 2 g/l,  
potassium: virtually none or in the concentration range of 0.030 to 1.5 g/l,  
sodium and potassium: in the concentration range of 0.025 to 1.5 g/l as sodium, potassium being converted to sodium on a molar basis,  
silicon complex fluoride: in the concentration range of 0.01 to 4 g/l and/or  
boron complex fluoride: in the concentration range of 0.01 to 4 g/l, calculated as  $\text{SiF}_6$  and  $\text{BF}_4$  respectively.
6. Process according to one of the above claims, characterised in that the dissolved contents in the phosphating solution are as follows:  
sodium: virtually none or in the concentration range of 0.060 to 1.8 g/l,

- potassium: in the concentration range of 0.035  
to 1.4 g/l,  
sodium and potassium: in the concentration range  
of 0.05 to 2 g/l as sodium, potassium being  
5 converted to sodium on a molar basis,  
silicon complex fluoride: in the concentration  
range of 0.02 to 1 g/l and/or  
boron complex fluoride: in the concentration range  
of 0.02 to 3 g/l, calculated as  $\text{SiF}_6$  and  $\text{BF}_4$   
10 respectively.
7. Process according to one of the above claims,  
characterised in that the dissolved contents in the  
phosphating solution are as follows:  
15 nickel: virtually none or in the range of 0.001  
to 3 g/l and/or  
manganese: virtually none or in the range of 0.002  
to 5 g/l.
- 20 8. Process according to one of the above claims,  
characterised in that the dissolved contents in the  
phosphating solution are as follows:  
dissolved iron<sup>2+</sup> ions: virtually none or in the  
concentration range of 0.005 to 3 g/l and/or  
25 complexed iron<sup>3+</sup> ions: virtually none or in the  
concentration range of 0.005 to 1 g/l.
9. Process according to one of the above claims,  
characterised in that the dissolved contents in the  
phosphating solution are as follows:  
30 silver: virtually none or in the concentration  
range of 0.001 to 0.080 g/l and/or  
copper: virtually none or in the concentration  
range of 0.001 to 0.050 g/l.

10. Process according to one of the above claims,  
characterised in that the dissolved contents in the  
phosphating solution are as follows:  
titanium: virtually none or in the concentration  
5 range of 0.001 to 0.200 g/l and/or  
zirconium: virtually none or in the concentration  
range of 0.001 to 0.200 g/l.
11. Process according to one of the above claims,  
10 characterised in that the dissolved contents in the  
phosphating solution are as follows:  
ammonium: virtually none or in the concentration  
range of 0.01 to 50 g/l and/or  
nitrate: virtually none or in the concentration  
15 range of 0.01 to 30 g/l.
12. Process according to one of the above claims,  
characterised in that the dissolved contents in the  
phosphating solution are as follows:  
20 sulfate: virtually none or in the concentration  
range of 0.005 to 5 g/l and/or  
chloride: virtually none or in the concentration  
range of 0.020 to 0.5 g/l.
- 25 13. Process according to one of the above claims,  
characterised in that the phosphating solution  
contains at least one accelerator selected from the  
group of compounds or ions based on  
nitrogen-containing compounds in the concentration  
30 range of 0.01 to 8 g/l,  
chlorate in the concentration range of 0.01  
to 6 g/l,  
hydroxylamine in the concentration range of 0.01  
to 3 g/l,  
35 peroxide, including water-soluble organic peroxide,  
in the concentration range of 0.001 to 0.200 g/l,  
calculated as H<sub>2</sub>O<sub>2</sub>,

with contents in the concentration range given.

14. Process according to one of the above claims,  
characterised in that the content of magnesium in  
5 the phosphating solution is no more than 1 g/l,  
preferably no more than 0.15 g/l.
15. Process according to one of the above claims,  
characterised in that no or almost no precipitation  
10 product based on aluminium fluorocomplexes of  
ammonium, alkali and/or alkaline earth metal is  
deposited on the metallic surface, below the  
phosphate film and/or between the zinc phosphate  
crystals in the phosphate film on the surfaces of  
15 aluminium and/or at least one aluminium alloy  
phosphated in this way.
16. Process according to one of the above claims,  
characterised in that the pH value is maintained in  
20 the range of 2 to 4.
17. Process according to one of the above claims,  
characterised in that the content of free acid  
determined with KCl is in the range of 0.3 to 6  
25 points, the content of dilute total acid is in the  
range of 8 to 70 points and/or the content of total  
acid according to Fischer is in the range of 4 to  
50 points.
- 30 18. Process according to one of the above claims,  
characterised in that the phosphate coating is  
applied at 20 to 70°C.
19. Use of the substrates coated by the process  
35 according to at least one of claims 1 to 18 in  
strip production, for the production of components  
or body parts or pre-assembled elements in the

automotive or aircraft industry, in the  
construction industry, in the furniture industry,  
for the production of equipment and plant,  
particularly domestic appliances, measuring  
5 instruments, control devices, testing devices,  
structural elements, claddings and small parts; as  
wire, wire wrap, wire mesh, sheet, cladding,  
screening, a car body or part of a car body, as  
part of a vehicle, trailer, motorhome or aircraft,  
10 as an electronic or microelectronic component, as a  
cover, housing, lamp, light, traffic light element,  
a piece of furniture or a furniture part, part of a  
domestic appliance, stand, profile, moulded part  
with complicated geometry, crash barrier, radiator  
15 or fence element, bumper, part consisting of or  
with at least one pipe and/or a profile, window-,  
door- or bicycle frame or as a small part, such as  
e.g. a screw, nut, flange, spring or spectacle  
frame.